

The Sterile Neutrino Working Group

HFIR

Conveners: Bill Louis

Jon Link

Patrick Huber

Bryce Littlejohn

OscSNS
Detector

SNS
Target

Borexino

Sterile Neutrino Session

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3 + 1 3 + 2 1 + 3 + 1




Goals:

Overview main
measurement channels

Summarize future
opportunities

Identify experimental
challenges

Leave gory details of each
experimental opportunity
to afternoon sessions

08:30	Introduction 15' Speaker: Prof. Jonathan Link (Virginia Tech) Material: Slides 
08:45	Global Fits 30' Speaker: Prof. Andre de Gouvea (Northwestern University) Material: Slides 
09:35	Nu_mu to Nu_e appearance 30' Speaker: Prof. Alexandre Sousa (University of Cincinnati) Material: Slides 
10:40	Nu_e disappearance 30' Speaker: Prof. Randy Johnson (University of Cincinnati) Material: Slides 
11:30	Nu_mu disappearance 30' Speaker: Janet Conrad (MIT) Material: Slides 

Provide plenty of time to discuss details, options, bullet points

Takeaways from this discussion are captured in the following slides

Do Sterile Neutrino Physics



- Sterile neutrinos are well motivated in many extensions of the Standard Model.
- Persistent experimental anomalies have focused attention on the eV mass scale.
- This makes sterile neutrinos the subject of potentially high-reward experiments.
- Therefore, the P5 Planning Report recommends a targeted set of short-term, small-scale experiments.

Building for Discovery

Strategic Plan for U.S. Particle Physics in the Global Context



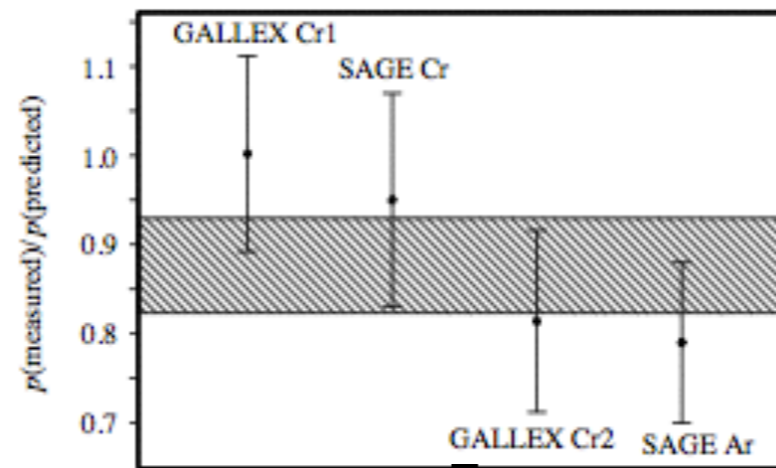
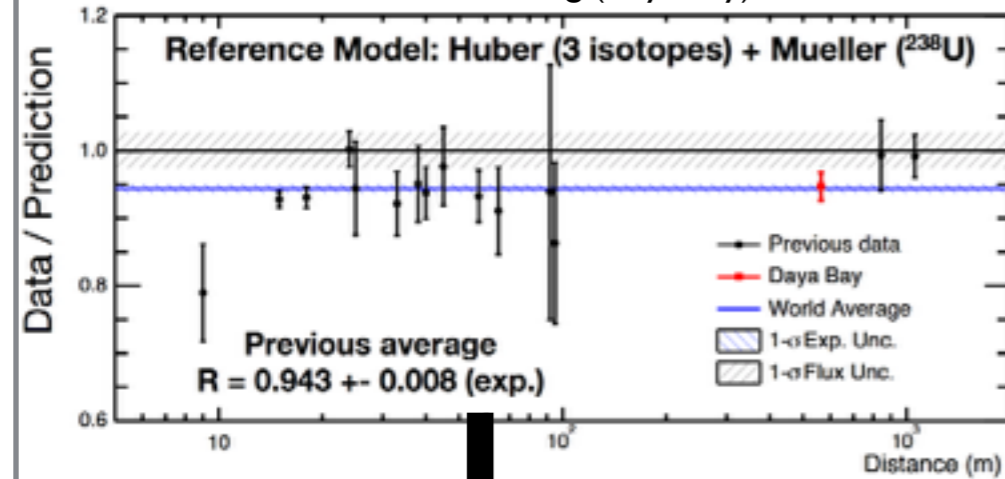
Recommendation 15: Select and perform in the short term a set of small-scale short-baseline experiments that can conclusively address experimental hints of physics beyond the three-neutrino paradigm. Some of these experiments should use liquid argon to advance the technology and build the international community for LBNF at Fermilab.

Use Oscillimetry

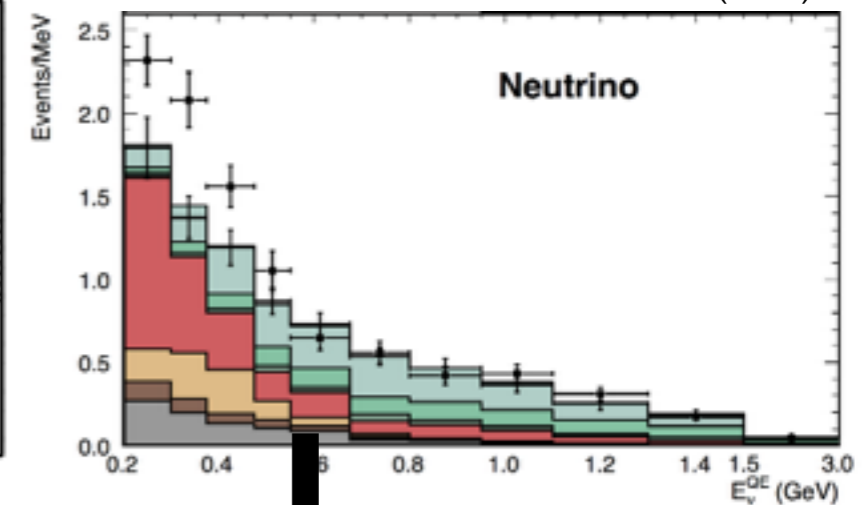
3+1 3+2 1+3+1

- Direct tests of existing anomalies should seek to demonstrate the sterile neutrino's oscillatory nature

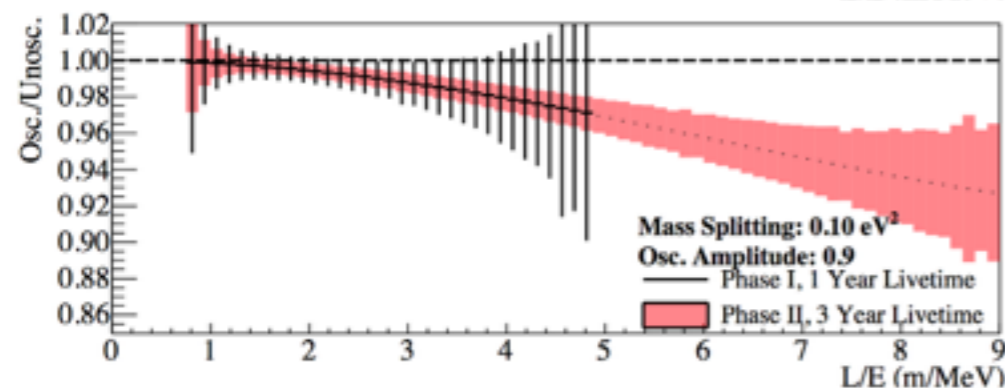
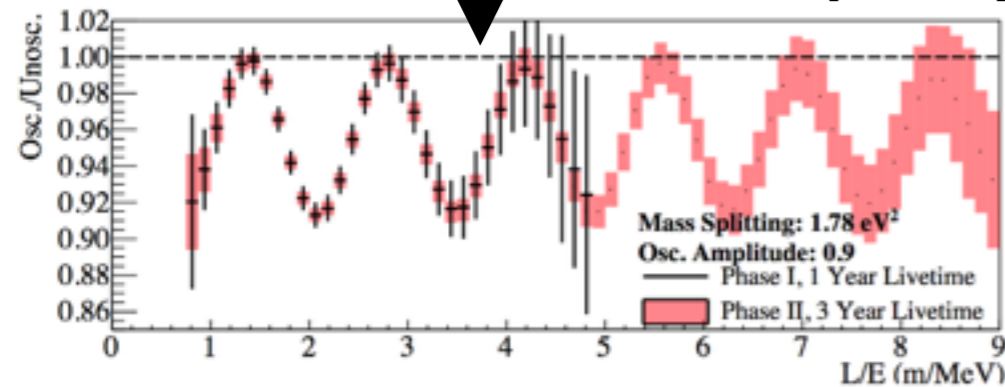
C. Zhang (Daya Bay), Neutrino 2014



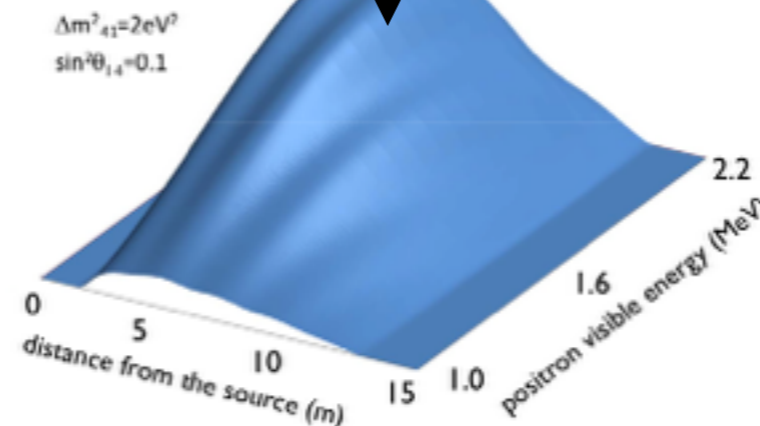
MicroBooNE, PRL 110 (2013)



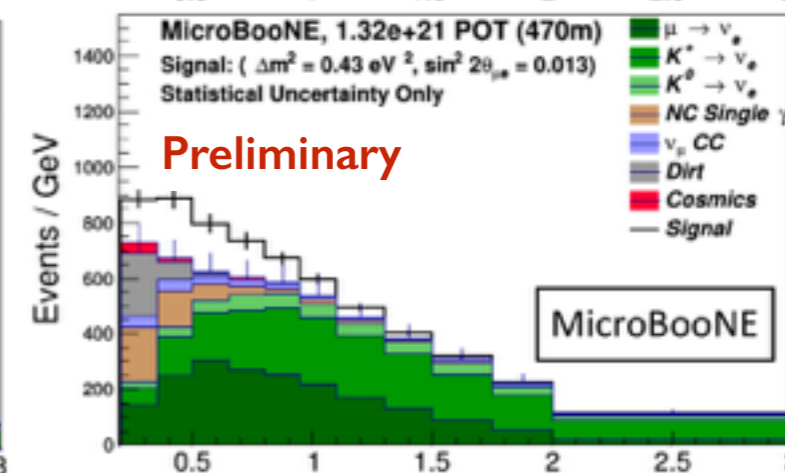
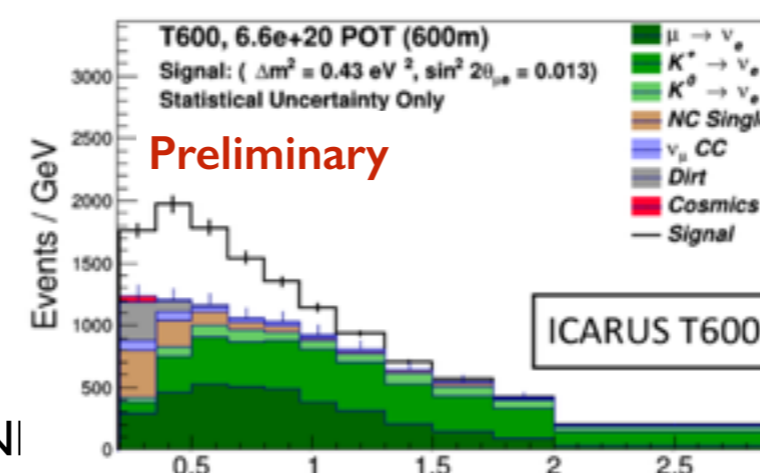
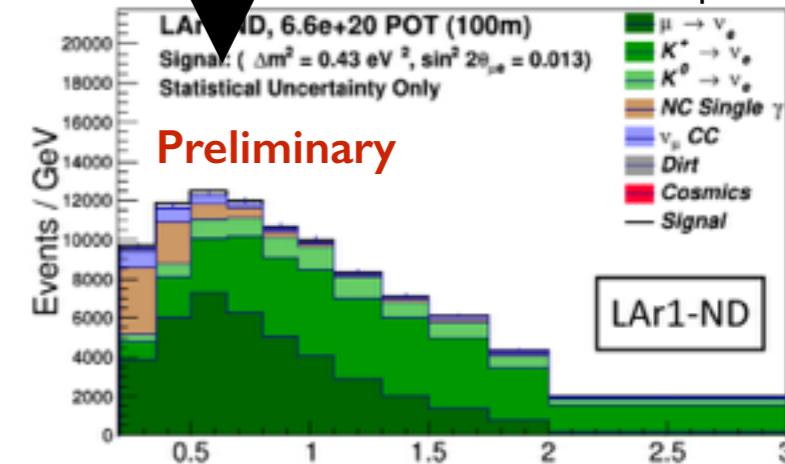
PROSPECT, arXiv[1309.7647]



SOX, arXiv[1304.7721]



SBN Fermilab PAC Proposal

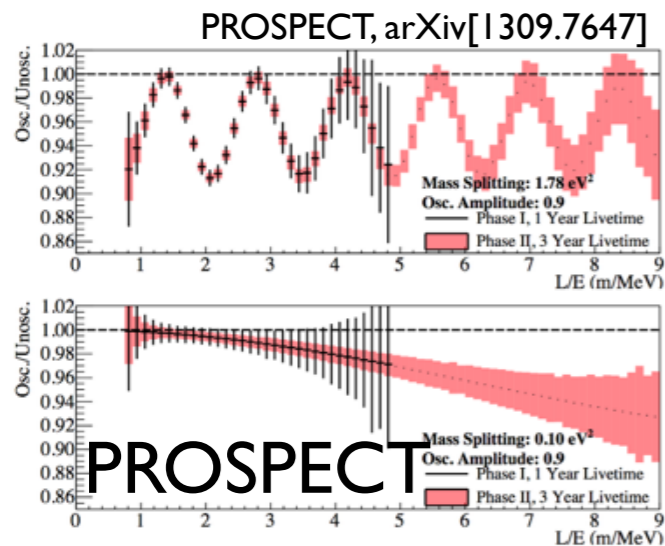


Investigate All Main Channels

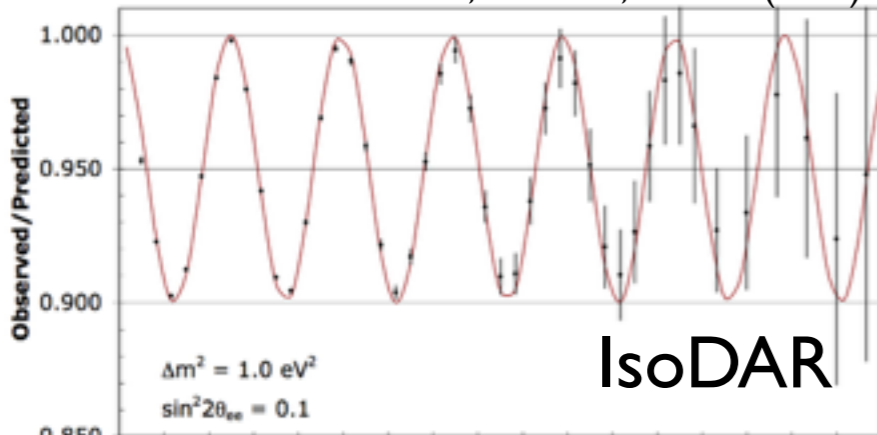


- Investigation of three main channels is needed.

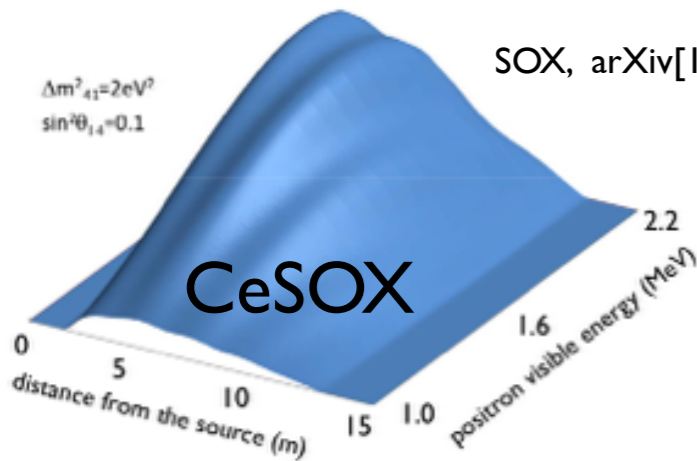
$\bar{\nu}_e$ dis



Conrad, Schaevitz, PRD 89 (2014)

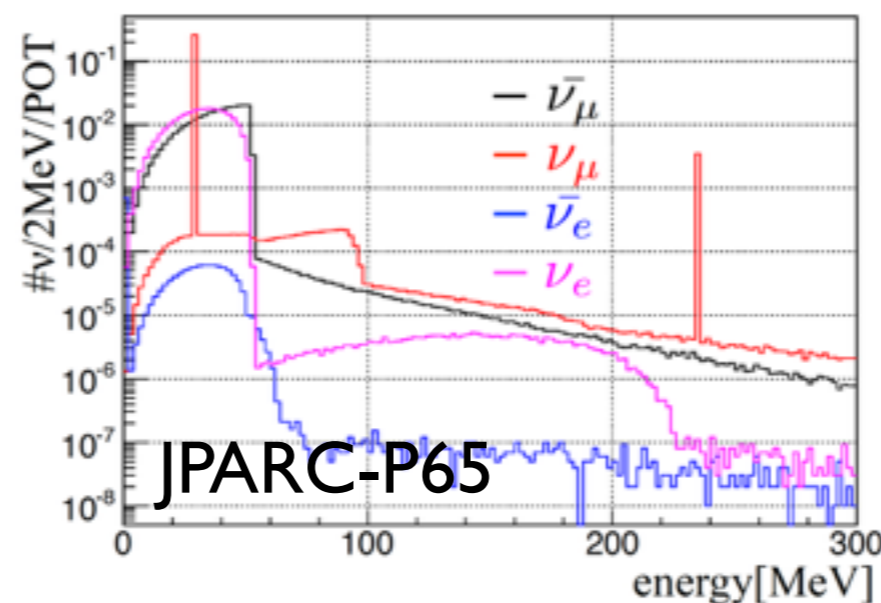
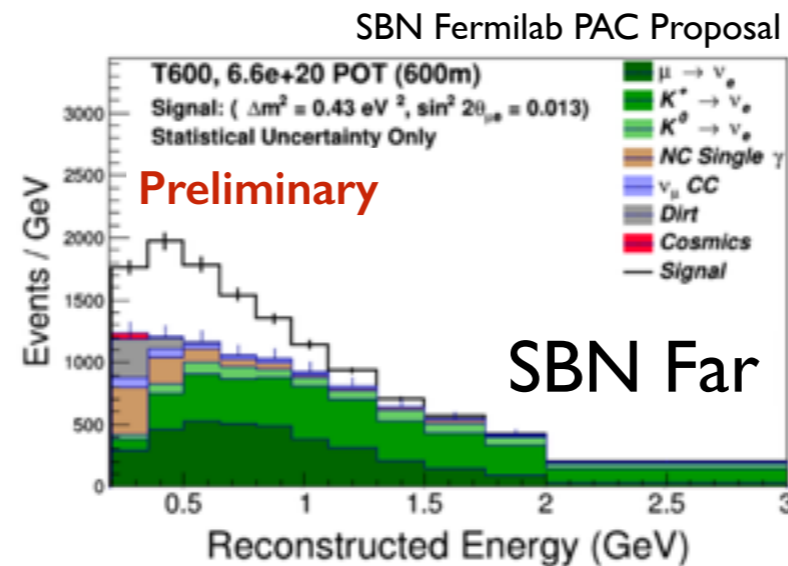


SOX, arXiv[1304.7721]



etc.

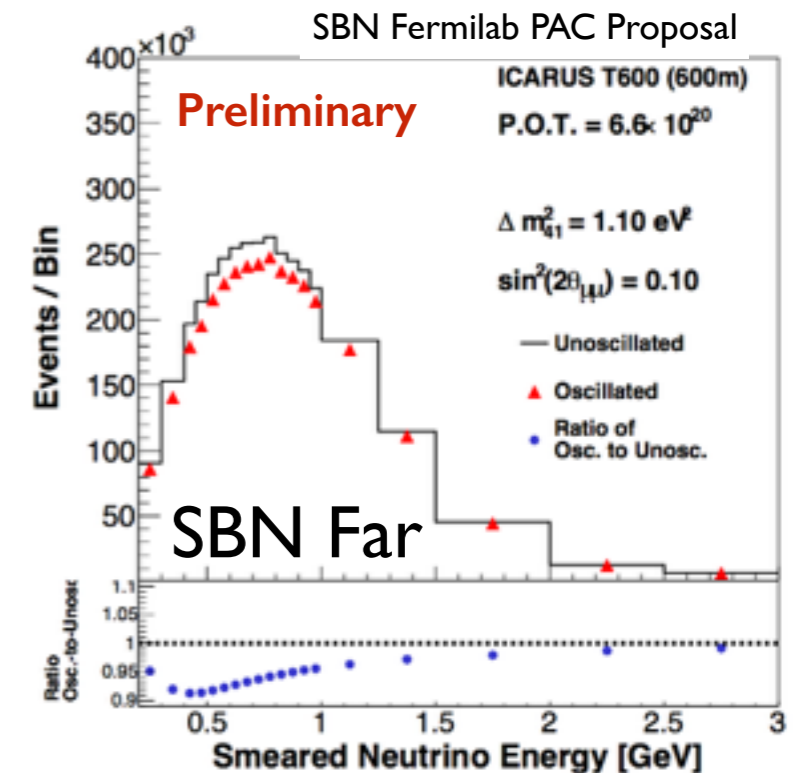
ν_e app



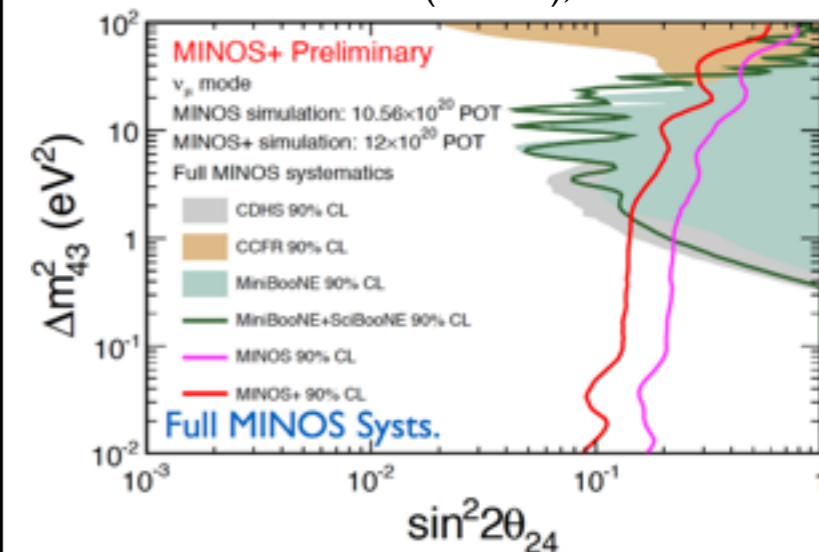
etc.

WINP: Sterile Summary

ν_μ dis



A. Sousa (MINOS), Neutrino 2014



etc.

Opportunities For Short-Term Results



Several proposed efforts have the potential to provide extensive coverage of the suggested space, a high-impact physics measurement, within discussed INP constraints.

Short-Term R&D Benefits



- Short-term investment in detector R&D towards future sterile oscillation experiments could reduce risk, lead to long-term cost savings, and provide the foundation for precision measurements if sterile neutrinos are observed
 - R&D to enable longer-term precision oscillation experiments
 - Phasing up of existing experiments

